Board of Scientific Advisors
ad hoc Working Group on Prevention
Working Group Report

Strategies to Accelerate Progress in Cancer Prevention Research

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NIH NATIONAL CANCER INSTITUTE

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Today's Topics

- Prevention Working Group Overview
- Cancer Prevention: Challenges and Promise
- Working Group Recommendations

Prevention Working Group Overview

Prevention Working Group Functional Statement

Consider how best to utilize the significant, albeit limited, resources and personnel of NCI in developing and sustaining a cancer prevention and early detection research program.

- Working Group membership will include select BSA and NCAB members, as well as individuals with expertise in prevention, early detection, risk assessment, data science, technology, clinical informatics, consumer health, basic research, translational research, and other domains.

Prevention Working Group Membership

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Cancer Prevention: Challenges and Promise

Challenges to Accelerate Prevention

Significant and special challenges inherent in cancer prevention and screening research that make it difficult to do well.

These include:

- the healthy population who should not be exposed to undue risk,
- the very long timeline for trials and assessment of efficacy for most preventive interventions,
- the need for successful conduct of prevention research in all communities,
- critical importance of work in exposures and lifestyle, where most people want to reduce cancer risk, and the
- ongoing difficulty with assessment of long-term endpoints within grant periods that are artificially brief.

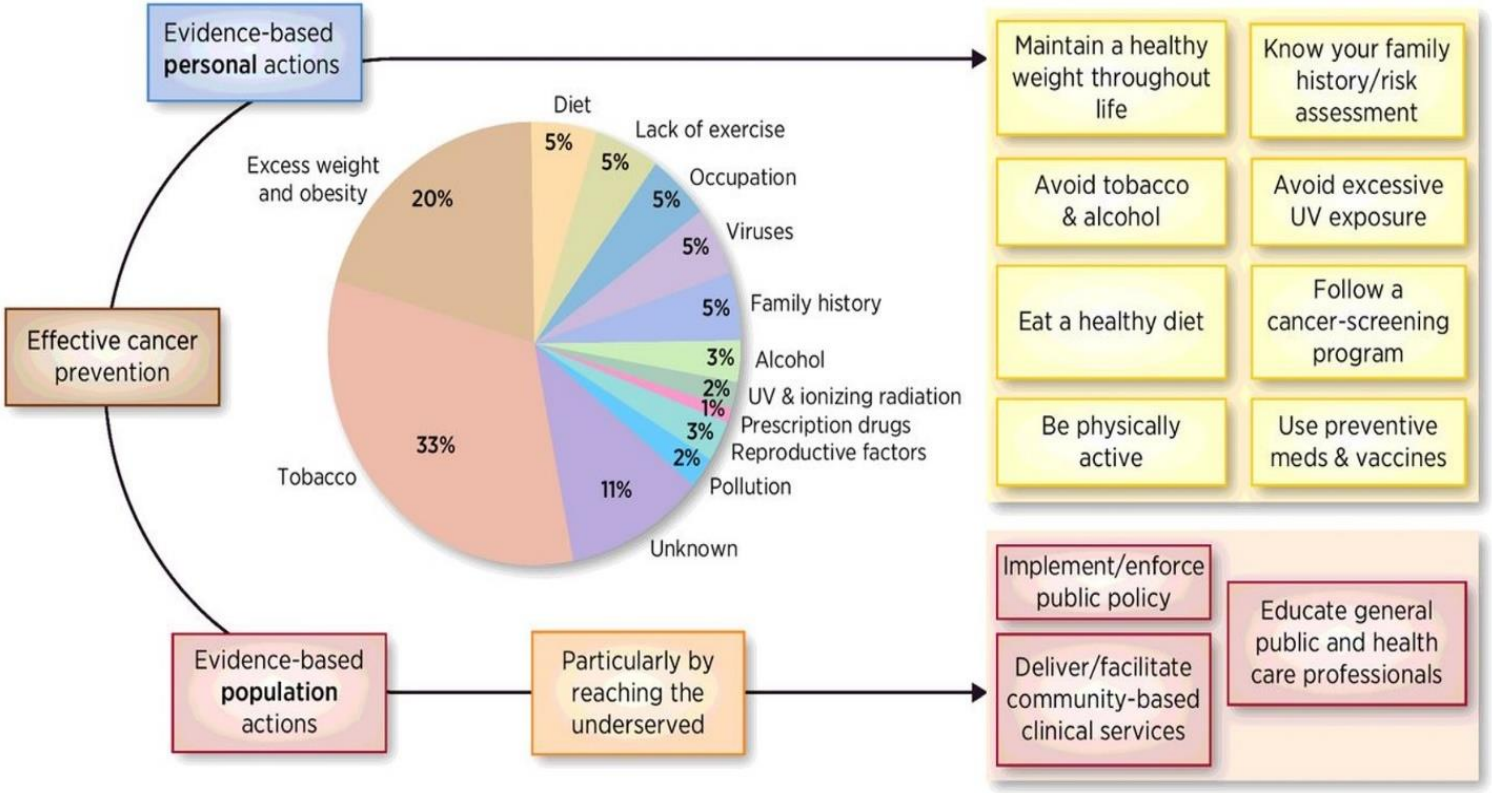
Challenges to Accelerate Prevention

- The research community must be incentivized to expand to prevention and screening research the explosion of basic science, technologies, immunology and big data that have been rapidly applied to therapeutics research so successfully.
- The experience of the COVID-19 pandemic has renewed recognition of the effects of social determinants of health, which impact cancer prevention research as well.
- Disparities must be at forefront of all prevention research planning and implementation.
- While NCI has recently placed greater emphasis on the intersection of biologic pathways and disparities through the Provocative Questions and the SPORE programs, much remains to be done.

The Promise of Prevention

One-third to one-half of cancer deaths are attributable to modifiable risk factors (pie chart) in western populations

Effective cancer prevention requires evidence-based personal and population actions



Lippman et all Cancer Prev Research 2018

Working Group Recommendations

Increasing lifestyle and environment research: prevention opportunities, challenges, and communication

Recommendations

- Target multiple behaviors simultaneously
- Use mobile apps and wearable technologies (mHealth approaches)
- Use AI and ML in preventive technologies, jointly with mHealth approaches
- Implement early interventions in children/AYA before behavioral habits are engrained
- Study the impact of behavior change on recurrence and mortality (tertiary prevention)

Increasing lifestyle and environment research 2

- Study the impact of behavior/lifestyle on quality of life during survivorship
- Determine the mechanisms underlying successful behavior change and/or relapse
- Validate and measure intermediate biomarkers (immune, microbiome, etc.)
- Use behavioral prevention strategies targeted to under-represented minorities and underserved populations
- Conduct cohort studies of specific ethnic/racial groups or rural populations
- Study interventions that translate to the population (effectiveness, implementation, and evaluation)

Enabling Research that Addresses Prevention in Disparate Populations

Recommendations

- Identify new strategies to bring evidence-based cancer prevention interventions to reduce the burden of cancer for all populations
- Increase basic and translational science to focus on populations experiencing cancer disparities
- Develop a deeper understanding of how racism drives cancer risk
- Increase eligibility for research studies and clinical treatment trials of populations with multiple comorbidities as experienced by populations with cancer disparities and promote the development of patient engagement approaches tailored to minority and underserved populations

Optimizing Opportunities using Biomarkers in Cancer Prevention Research

Recommendations

- NCI should continue to invest significantly in biomarker development, which remains critical to efforts in precision prevention
- Convene a working group to provide critical and thoughtful assessment of the most important opportunities in the field
  - optimal areas for investment
  - the best strategies to accelerate their development

Expanding Data Science Opportunities in Risk Stratification and Point of Care Precision Prevention

Recommendations

- Accelerate adaptation of technologies for real time, point of care diagnostics, monitoring, and decision making
- Build rubrics and standards for ML and AI models as a priority
- Develop strategies for visualizing data
- Use updated data sources to detect change point and timing for interventions
- Maximize populations engaged in prevention research technologies innovation
- Refine analytic approaches and point of care communication opportunities

Promoting Novel and Innovative Research Designs

Recommendations

- Invest in deeper understanding of mechanisms underlying obesity and cancer
- Generate and evaluate vaccines that anticipate the most likely neoantigens in the highest risk populations
- Invest in AI directed toward improvement in prediction of aggressive versus indolent behavior of early stage solid tumors
- Study approaches that integrate diverse data from novel data sources including lifestyle and exposure measures, and require rigorous standards for evaluation, validation and implementation
- Investment in biostatistics and bioinformatics is essential across all areas

Promoting Novel and Innovative Research Designs 2

- Address unique challenges of chemoprevention research
  - Improve risk stratification of at-risk populations
  - Encourage development of improved preclinical models to enable the identification of better targets for interventions
  - Consider novel trial designs that may support different models of chemoprevention
  - Improve communication of risks, benefits, and concepts of chemoprevention which are essential to increase uptake

Consider Infrastructure Resources NCI Could Facilitate to Enhance Prevention Research

Recommendations

- Enhance initiatives like the Pre-Cancer Atlas that bridge technology development from work with established tumors to premalignancy; require data generated be made available to the research community
- Develop inexpensive, point of care technologies to enhance early detection in healthy people
- Leverage NCI resources (e.g., SEER) and expertise in spatial sciences/GIS mapping to assess and monitor progress in reducing cancer incidence and disparities
- Link translational and population scientists with existing tissue/clinical archives to study mechanisms of cancer evolution with time and treatment

Consider Infrastructure Resources NCI Could Facilitate to Enhance Prevention Research 2

- Create repositories for AI- and ML-generated data from imaging and pathology for research in pre-cancer and risk reduction, and serving as a common validation data source
- Harness AI and ML to improve prediction of multi-level cancer risk for behavioral cancer prevention in multi-ethnic populations to reduce cancer disparities
- Develop capacity for synthesis and distribution of placebos for placebo-control chemoprevention trials, both NCI-supported and other investigator-initiated studies

Conclusions

- The working group reviewed strategies to accelerate progress in cancer prevention research
- We concluded that while the underlying issues in prevention research pose special considerations, advances in technology, data science, immunology, and risk assessment offer many opportunities to bring new focus to and progress in cancer prevention
- Identification of new approaches to bring evidence-based interventions to all population groups – across racial and ethnic groups, other minorities and underserved populations - remains an urgent priority
- NCI should promote the development of new infrastructure resources and novel research designs that may accelerate progress in cancer prevention

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